

بسم الله الرحمن الرحيم

A Course on

Energy Conservation



Solar Energy

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November 2012

Introduction

The type of radiation coming from the Sun depends on temperature.

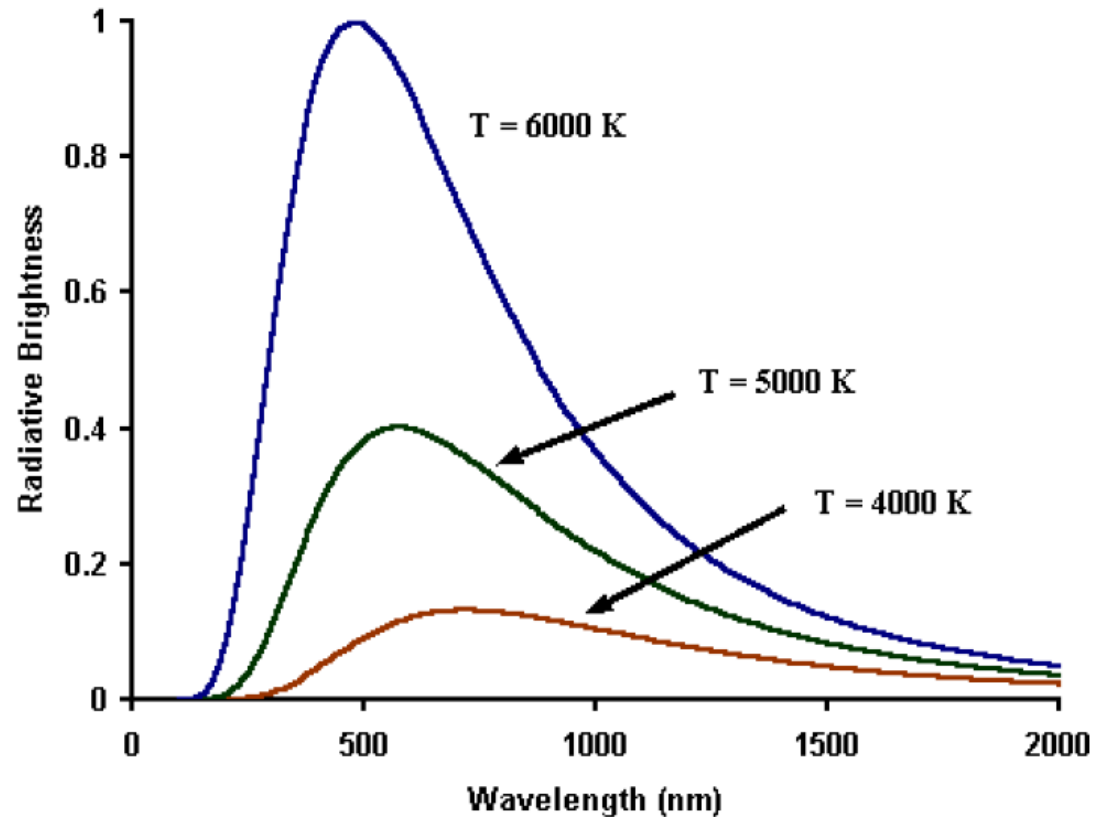


Introduction

The Sun is emitting electromagnetic radiation in wide variety of wavelengths.

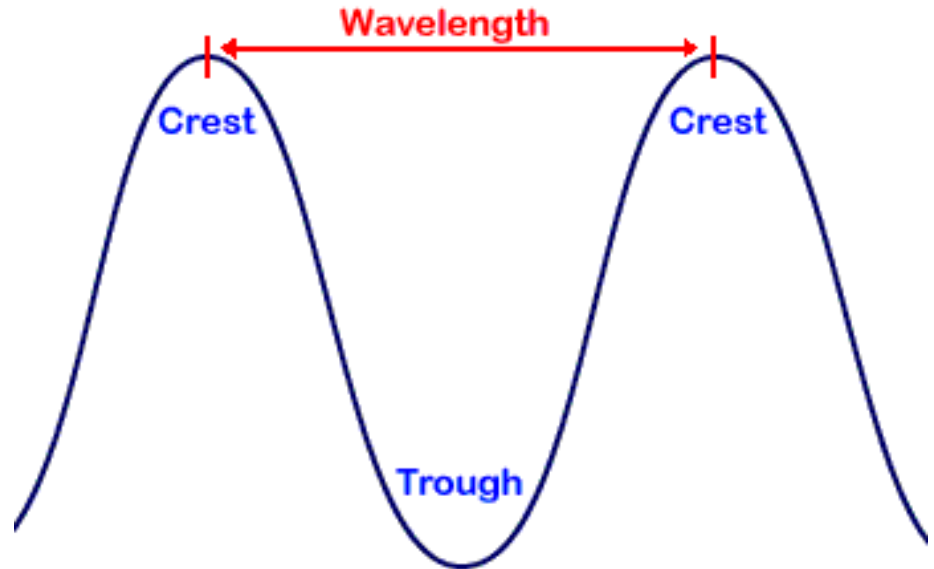
Introduction

Theoretical plot of the energy emitted by three perfect blackbody radiators of different temperature..



Introduction

The Sun radiates 1.6×10^7 watts of power per square meter from its surface at all wavelengths.



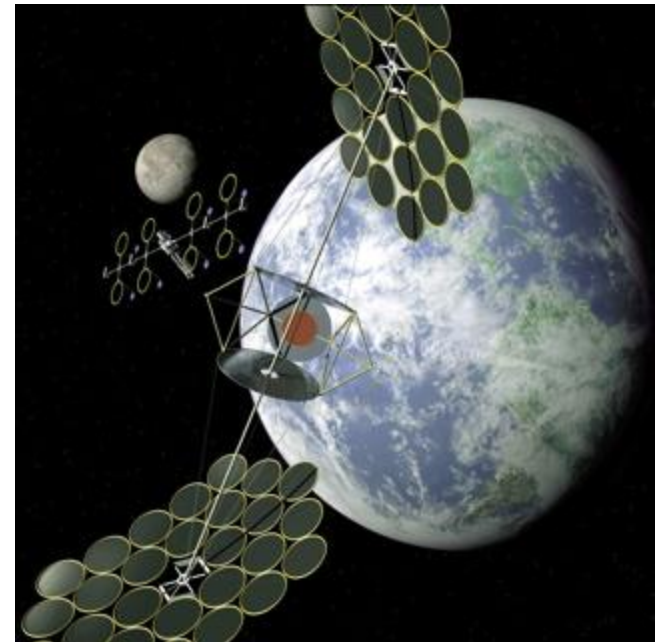
Introduction

Latitude and Longitude



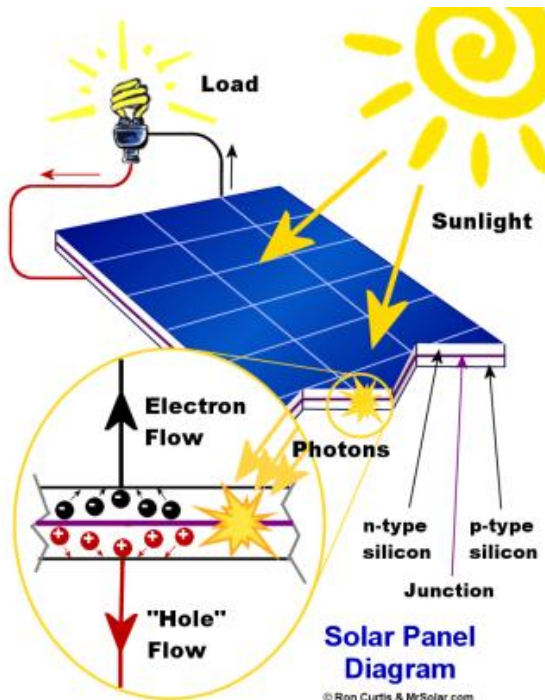
Types of Solar Systems

People think solar-powered **calculators** or **satellites**, they convert light directly into electricity via the photoelectric effect.



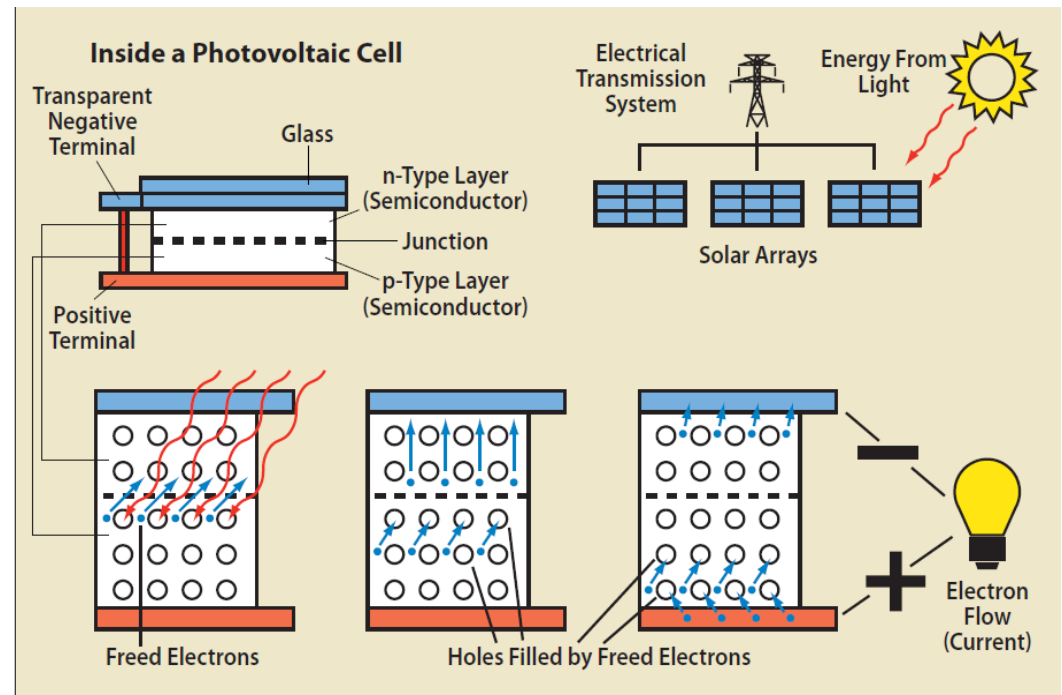
Types of Solar Systems

Photovoltaic systems are not the only way to convert sunlight into electricity.



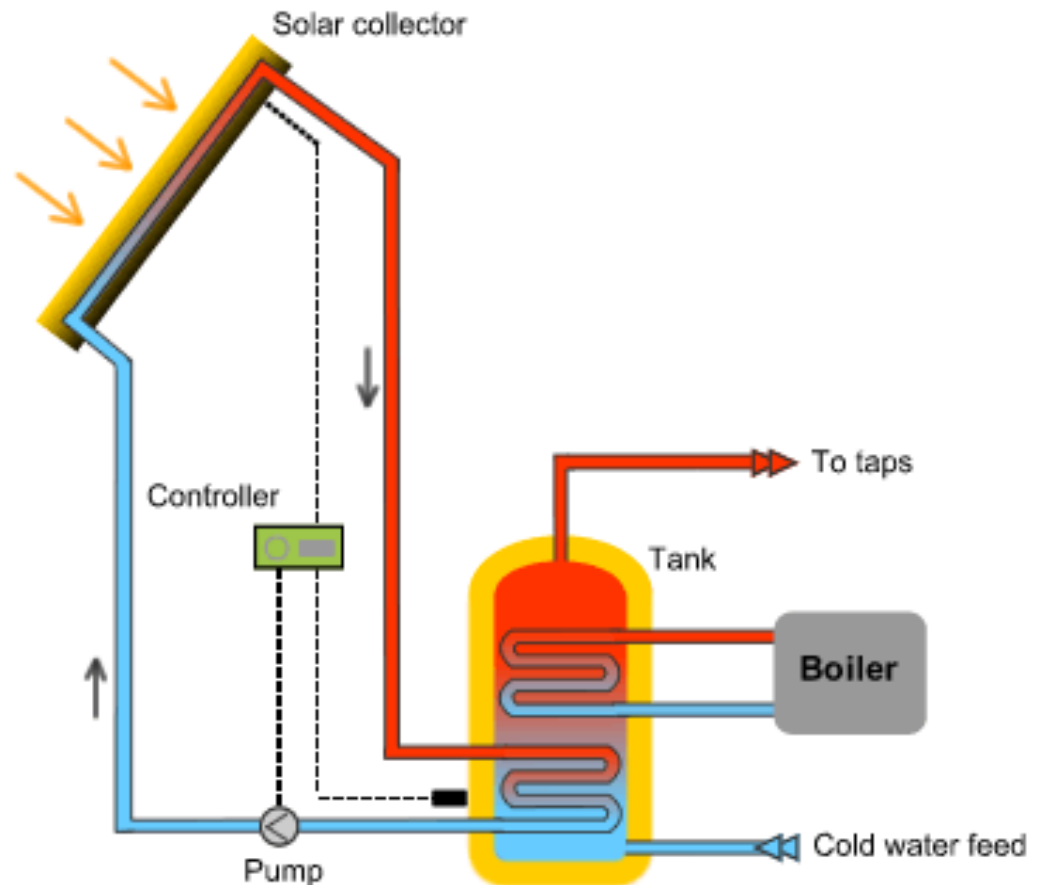
Types of Solar Systems

Solar Energy Industries Association (SEIA) reports that 94 percent of PV modules used today are made of crystalline silicon.



Types of Solar Systems

Solar thermal electrical systems use sunlight in order to boil water for a turbine generator.



Types of Solar Systems

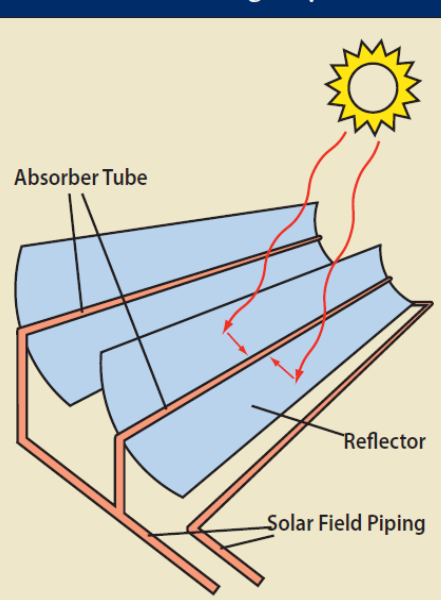
Simple and widely used applications of solar thermal energy include solar water heating, swimming pool heating and agricultural drying.



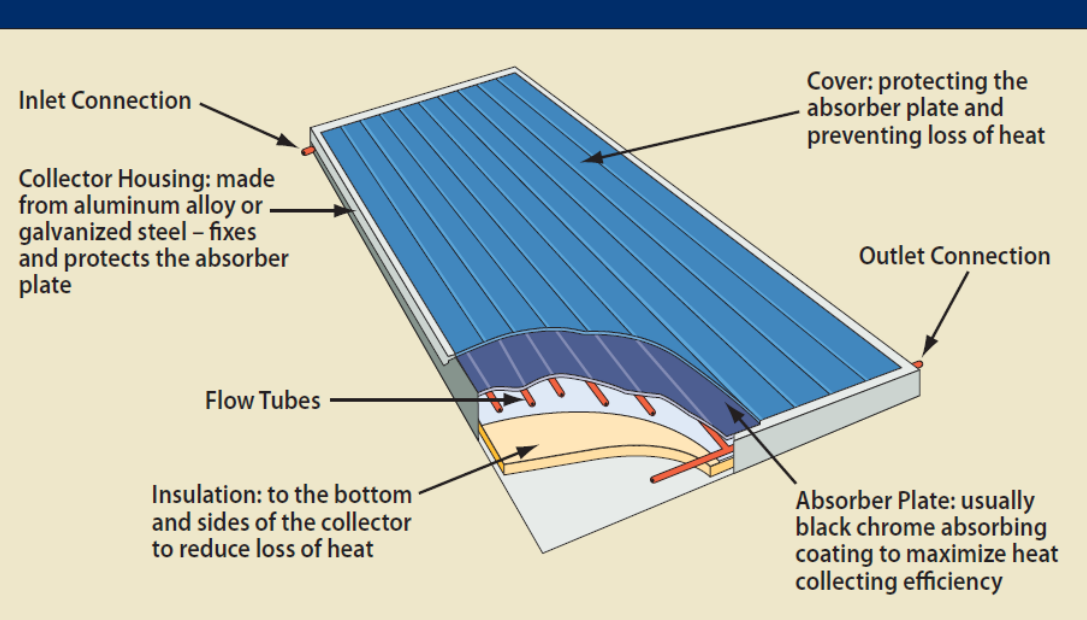
Types of Solar Systems

Flat-plate collectors large, insulated metal boxes with glass or plastic covers and dark heat absorbing plates are the most common collectors used for home solar water and space heating.

A Parabolic Trough System

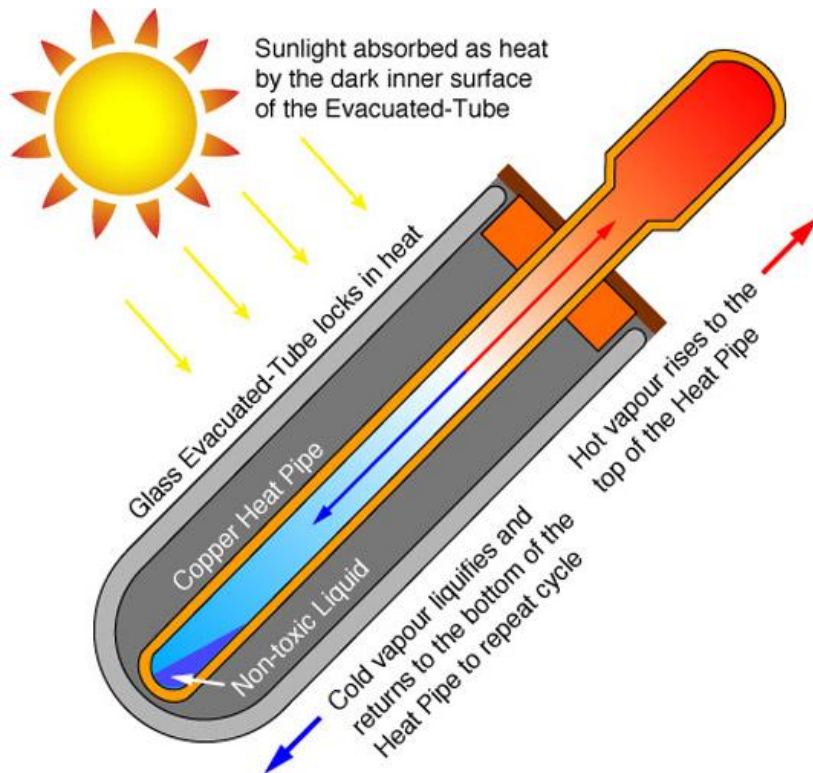


Flat Plate Collector

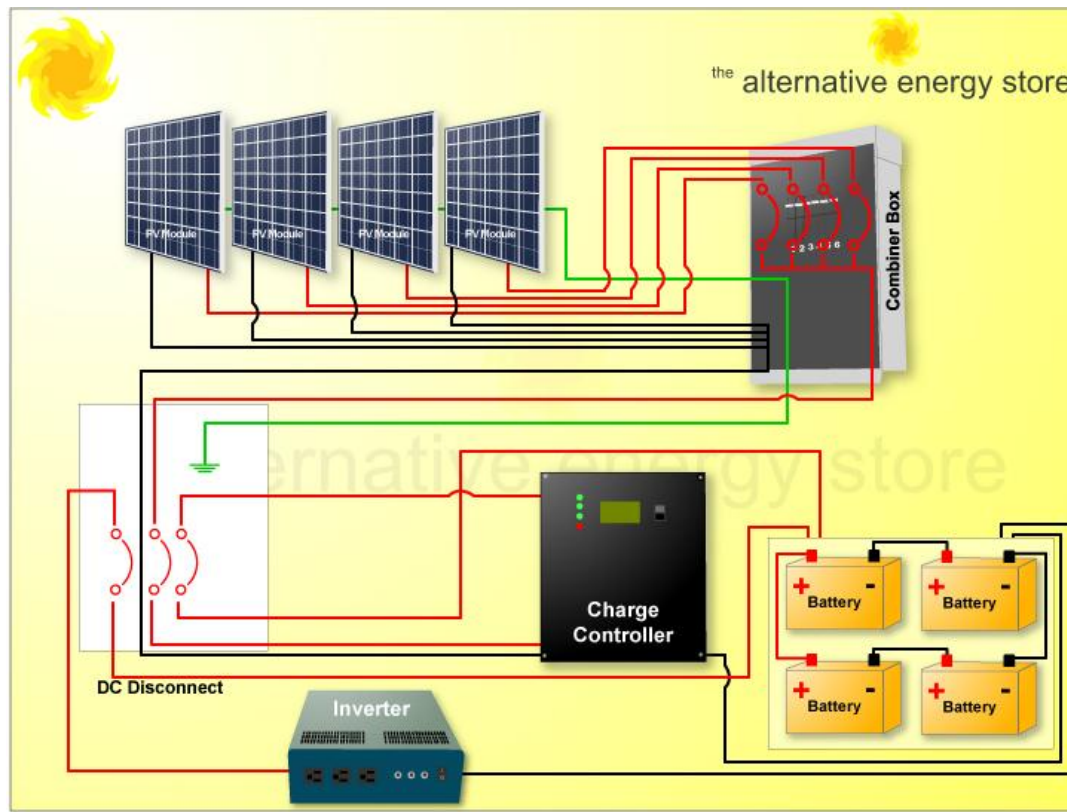


Types of Solar Systems

Other common varieties are evacuated-tube collectors and integral collector storage systems.



Energy Storage



Solar Intensity

The intensity of solar energy at any point in the solar system is inversely proportional to the square of its distance from the sun

$$I \propto \frac{1}{d^2}$$

Where: **I** is solar intensity
d is distance from the sun.

Solar Intensity

In general terms, the amount of light stays the same, but it is spread over an increasingly larger area as you move away from the light source, so the intensity is less.

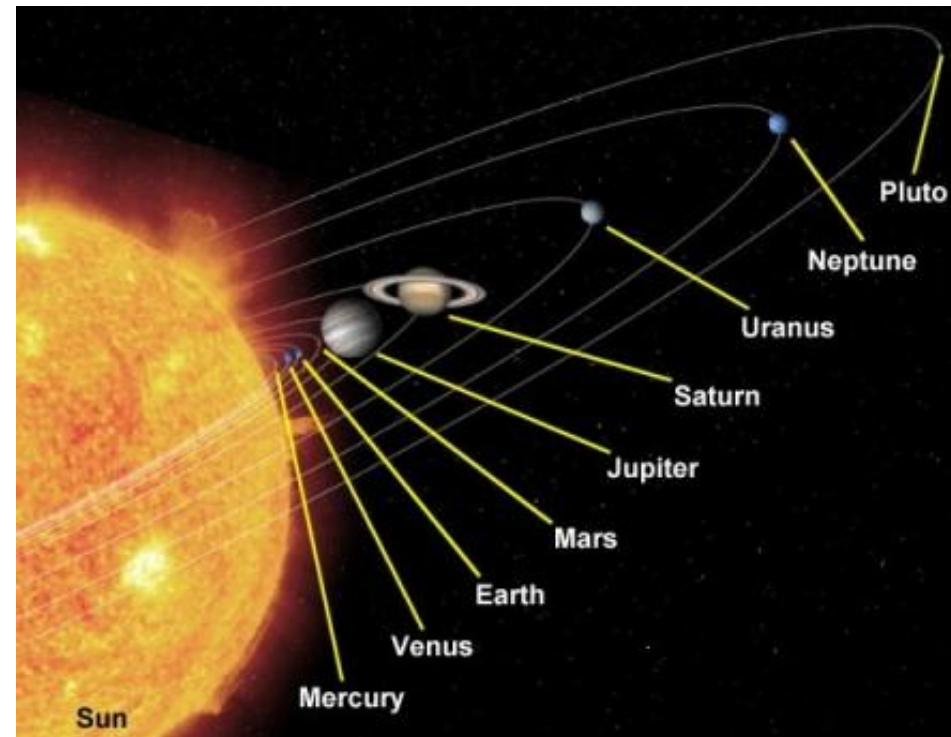
When considering the intensity of solar radiation on the nine planets of the solar system, it is sometimes useful to think of relative intensity, a ratio comparing the solar intensity to that on Earth.

$$\text{Relative solar intensity} = \frac{I_{\text{planet}}}{I_{\text{Earth}}} = \frac{d_{\text{Earth}}^2}{d_{\text{planet}}^2}$$

Solar Intensity

One astronomical (AU) unit is defined as the mean Earth sun distance, which is (rounded to 150 million km)

$$\frac{I_{\text{Mars}}}{I_{\text{Earth}}} = \frac{d_{\text{Earth}}^2}{d_{\text{Mars}}^2} = \frac{1^2}{1.524^2} = 0.431$$



Thank you

**Any
questions**